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FRUIT INSECT INVESTIGATIONS

Effect of methyl bromide-hydrocyanic acid mixtures on Japanese beetle larvae.--W. E. Fleming, E. D. Burgess, and W. W. Maines, of the Japanese beetle laboratory at Moorestown, N. J., have reported on tests with mixtures of methyl bromide and hydrocyanic acid against larvae of the Japanese beetle. The tests were undertaken to determine whether the toxicity of the mixtures of these materials to the larvae was any greater than could be predicted from the toxicities of the isolated constituents. The methyl bromide and the hydrocyanic acid used in this investigation were the commercial grades used for fumigating purposes. The experiments were conducted in a 1,000-cubic-foot fumigation chamber at temperatures of 60° and 70° F. The air in the chamber was circulated continuously during the treatment. The methyl bromide was measured by weight on a solution balance and the hydrocyanic acid by volume in a special measuring cylinder. Both materials were vaporized by dropping them onto a copper coil maintained at a temperature of 160°. In conducting these experiments, the larvae were removed from soil, placed in groups of 100 individuals in special cages without soil, and subjected to the fumigating treatment. A total of 29,400 larvae were subjected to methyl bromide, hydrocyanic acid, and mixtures of these materials. At the completion of the treatment the larvae were transferred to special trays for observation. A record was made of the numbers dead, moribund, and normal in each treatment at intervals subsequent to removal from the chamber, the final observation being made at the end of 1 week. The tests showed that there is a definite synergistic action, in that a mixture of methyl bromide and hydrocyanic acid is more toxic to Japanese beetle larvae and the rate of insecticidal action is faster than would be anticipated from the inherent potencies of the components.

Development of Japanese beetle larvae in Philadelphia area.--As a result of larval surveys made late in May and early in June, T. N. Dobbins, Moorestown, has reported that in the Philadelphia area larval development was from 10 days to 2 weeks later than would be normally expected, as based upon the summary of soil surveys conducted during the years 1926-36, inclusive. In an average year the rapid metamorphosis preceding emergence becomes evident during the last few days in May in the latitude of Philadelphia. Surveys made in pastures (June 5) revealed no definite prepupae and less than 20 percent of the larvae undergoing the characteristic changes which immediately precede the definite prepupal condition. Normally approximately 16 percent of the soil forms are definitely prepupae at that period. Assuming normal air temperatures and precipitation for the remainder of June, very little emergence of adults will be evident in this area before the early part of the last week in June. Observations by other members of the laboratory staff show that, in general, the same conditions prevail at other points or areas, such as Westchester County, N. Y., northern New Jersey, Cape Charles, Va., Washington, D. C., and Harrisburg, Pa. In general, late spring development of larvae at all these places is from 10 to 14 days behind the normal; therefore beetle emergence will probably be somewhat delayed.

Colonization of *Tiphia vernalis*, a Japanese beetle parasite.--Late in May and early in June, J. L. King and associates, of the Moorestown laboratory, collected in the field and redistributed 151 colonies of 100 or more females each of *Tiphia vernalis* Roh., the imported wasp parasite of the Japanese beetle. In addition, 2,500 female *Tiphia* were supplied the Maryland State entomologist for rearing purposes and 500 were retained for experimental rearing at Moorestown. In all, a total of 19,745 females were collected on 4 collecting days. The 151 colonies were distributed as follows: New York, 50; New Jersey, 33; Pennsylvania, 38; Connecticut, 14; Delaware, 8; Washington, D. C., 8.

Plum curculio sprays effective.--The value of the petal-fall and shuck-off applications of lead arsenate spray for reducing the overwintered population of plum curculio adults in peach orchards is shown in jarring records reported by Oliver I. Snapp, of the peach-insect laboratory at Fort Valley, Ga. Jarring for adult plum curculios during the periods between petal-fall (time for first spray) and shuck-off (time for second spray), and between shuck-off and the beginning of the stone-hardening period, showed that there were more than twice as many plum curculios on the trees that did not receive the petal-fall and shuck-off applications of lead arsenate as on those that received these sprays. The results of the first jarring after the fruit entered the stone-hardening stage (May 8), indicated that the lead arsenate was losing its effectiveness after a period of 23 days following the shuck-off application, owing to weathering and to the growth of the fruit.

Blapstinus spp. hibernating in vineyards.--While making examinations of bark on grapevine trunks and of samples of nearby soil in the course of a survey of the overwintering population of larvae of the raisin moth (*Ephestia figulilella* Greg.), Dwight F. Barnes and George H. Kaloostian, of the Fresno, Calif., laboratory, recorded the presence of small darkling beetles of the genus *Blapstinus*. The work was done from January 4 to February 9, 1940. The species found were *B. rufipes* Casey and *B. dilatatus* Lec. Both were present under the rough bark of the vines in 6 vineyards, and the average number was 4 per vine on 60 vines. In soil near the vines, 262 were found in 14 1-square-foot samples. Records separating the species were made of the collections from 10 1-square-foot samples of soil. The total was 138, of which 117 were *B. rufipes* and 21 were *B. dilatatus*.

MEXICAN FRUITFLY CONTROL

Fruitfly infestations decrease.--The annual tree-to-tree inspection in the area regulated under Quarantine 64 was completed by May 31. Reports from each district indicate that a very thorough inspection was made and that little opposition was encountered in obtaining complete compliance with quarantine regulations. There was a decided decline in the number of properties found infested with Mexican fruitflies throughout 1939-40. In the crop year of 1938-39 infested fruit was located on 2,141 plantings. During the season just closed, infested fruit was found on only 578 groves. Traps continued to take many flies but few of them, when caught, appeared old enough to infest fruit, had any fruit been available for oviposition. If the seasonal trend in the fly population follows the path of previous years there should be a marked reduction in the number of flies in the groves by the early part of June.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Relation of European corn borer larval infestation to popcorn yield.--Morris Schlosberg, Toledo, Ohio, reports that a study of the effect of European corn borer larval infestation on the production of popcorn was made in 1939, near Toledo. The tests were conducted with a commercial hybrid strain of white popcorn planted on June 7, using 5 levels of infestation treatment, obtained by progressively higher hand applications of laboratory-produced egg masses, replicated 5 times in a Latin square. Larval population data were obtained on 5 plants and yield data on 20 plants in each plot. The larval populations, expressed as the mean number per plant per treatment level, and the yields, expressed as the mean number of pounds of shelled popcorn,[1] corrected for 15.5 percent moisture, per 20-plant sample per treatment level, are given in the following tabulation. The zero level of infestation indicated a complete escape from oviposition by the moths of a single-generation strain and the first generation of a 2-generation strain of the borer present in the locality, owing to competitive effects. Infestation by the second generation of the 2-generation strain, determined from samples of plants later dissected, was found to be uniformly distributed among the treatment levels within the limits of sampling error, thus failing to effect level-to-level changes in yield. The larval populations shown represent the surviving progenies from the egg masses placed on the plants by hand, since only these were concerned in producing level-to-level changes in yield. The yields represent the grain shelled from all the ears, regardless of condition. On the basis of the data shown in the tabulation, the coefficient of regression of yield on larval population was determined to be -0.121 ± 0.0057 pounds of shelled popcorn per plot (20 plants) per larva per plant. The mean yield of shelled popcorn per plot in the absence of borer infestation (the potential yield) was estimated to be 1.93 ± 0.038 pounds. From these values, the mean rate of loss of yield of shelled popcorn per additional larva per plant was calculated to be 6.27 ± 0.102 percent. The utilization of this index of loss is somewhat limited by the fact that it represents the results of a single strain at a given stage of plant development. It is probable that the index reflects a higher than average severity of injury to the plants, owing to the early stage of development of the strain when infestation occurred. Other studies have shown that the relative stage of development of the plants when infestation occurs affects the per borer rate of loss, higher rates of loss being associated with infestation at earlier stages of plant development.

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[1] Coefficient of simple correlation -0.997, highly significant (3 degrees of freedom).

	Mean number of larvae per plant	Shelled popcorn per 20-plant sample (corrected for 15.5 percent moisture)
		Pounds
	0.00	1.93
	2.00	1.72
	2.80	1.55
	5.32	1.31
	6.52	1.14
Standard error	0.505	0.119

The immediate effect of injury of the plants by the larvae was reflected in the production of smaller and fewer ears. As the level of infestation increased, a number of the potentially usable probably primary ears tended to be reduced to the nubbin class, and a number of the potentially nubbin ears, probably secondary, failed to be produced, thus reducing the total number of ears. The production of relatively smaller ears at the higher levels of infestation was reflected in the relative weights of the ears. A distinct shift in the frequencies of heavier and lighter ears toward the production of lighter ears, was evident at the higher levels of larval population. The actual size of the ears, as reflected by their length and diameter, was found to account for approximately 96 percent of the variability in weight among the ears.

Recovery of introduced parasite of the vetch weevil.--J. S. Pinckney, Carlisle, Pa., reports that in May and June 1939 two releases of the foreign parasite Tetrastichus sp., imported from the European parasite laboratory in France, were made in North Carolina. At the Piedmont Experiment Station, located at Statesville, 1,175 were released on a plot of vetch on May 26 and 1,089 were released on June 2 in a vetch field near Salisbury. Three collections of pods were gathered on 3 different dates at each release area, brought into the laboratory, and placed in rearing boxes. Since March 20, 1940, 5 females of this species have been reared from this material--4 from the area of release at Statesville and 1 from the Salisbury area.

Reaction of plants to hessian fly not influenced by treatment of wheat seedlings with colchicine or thiamin.--E. T. Jones, of this Division, and H. D. Young, of the Division of Insecticide Investigations, Manhattan, Kans., report that tests to ascertain whether plants treated with colchicine and thiamin would react differently to infestation by hessian fly showed that treatment with these substances does not affect the resistance or susceptibility of wheat plants to hessian fly infestation. Although vigor of growth of the plants treated with colchicine apparently was reduced and in the plants treated with thiamin vigor was increased, especially in the early stages of growth, neither treatment increased the compactness or looseness of the leaf sheaths (a factor which undoubtedly is involved in the survival of fly larvae in the critical first stages of development). Based on a quadruplicate series with 100 plants examined, for each separate variety and treatment, results were as follows:

Variety of wheat	Plants treated with				Untreated plants	
	Colchicine		Thiamin			
	Infested	Pupae per infested plant	Infested	Pupae per infested plant	Infested	Pupae per infested plant
	Percent	Number	Percent	Number	Percent	Number
Susceptible:						
Tenmarq	83	3.0	95	4.2	95	3.4
Ceres	89	1.9	92	2.9	88	2.5
Kawvale	69	3.2	77	3.5	71	4.0
Resistant:						
Illinois No. 1 W38	1	1.0	0	0	2	1.5
Triumfo	59	2.1	50	2.3	57	2.5

The thiamin treatment consisted of soaking the seeds in a solution of thiamin of commercial strength. The solution was also applied to the soil for an extended period as the plants developed. The plants treated with colchicine were sprayed daily during early growth with 0.5- and 1.0-percent solutions. In addition to this experiment, seeds of the varieties mentioned were soaked in 0.25- and 0.5-percent solutions and day-old seedlings in 0.1-percent solution of colchicine for 12 hours. Most of the seedlings and the plants resulting from the treated seed died from poisoning, but surviving plants exposed to infestation gave results comparable with the results obtained with the sprayed series.

Vacuum fumigation of sacked feed with methyl bromide.--R. T. Cotton and J. C. Frankenfeld, Manhattan, report that in the vacuum fumigation of oat feed with methyl bromide, a dosage of 4 pounds of the fumigant per 1,000 cubic feet of space, with a full load, gave a 100-percent kill of flour beetle eggs and adults with a 3-hour exposure. With a 15-hour exposure a dosage of 3 pounds per 1,000 cubic feet of space gave a complete kill. The temperature of the feed in the first case was 67° F. and in the second 68°.. It is interesting to note that in both cases insects were actively crawling over the bags of feed when they were removed from the vacuum chamber at the end of the fumigation. They were all dead, however, within 24 hours. This delayed killing effect is characteristic of methyl bromide and some other fumigants.

Wind interferes with mill fumigation.--Messrs. Cotton and Frankenfeld also report that in the recent fumigation of a brick flour mill and warehouse with methyl bromide during a period when the wind reached at times a velocity of 38 miles per hour, practically no kill was obtained in the warehouse, which was on the windward side of the building. The gas was apparently all blown over into the mill, where the kill was satisfactory. The dosage of 1 pound of methyl bromide per 1,000 cubic feet had been found entirely adequate in the warehouse last year, when there was no wind. The desirability of delaying a fumigation until the wind has died down is evident.

JAPANESE BEETLE CONTROL

Farm-products quarantine for Japanese beetle modified.--Effective May 27, regulations under the Japanese beetle quarantine on the movement of fruits and vegetables were modified to limit the restrictions to fruits and vegetables moving from the area of heavy adult flight via refrigerator car or motortruck. An analysis of inspection records for the last several years shows that a negligible number of beetles have been removed from the 9 articles of fruits and vegetables under quarantine when moved by any means of transportation from the entire regulated area. Maintenance of inspection centers in such sparsely infested cities as Boston, Mass., Pittsburgh, Pa., and Canton, Ohio, can no longer be justified by the few adults removed from farm products submitted for inspection at these points. Under the revised regulation, restrictions have been lifted on the movement of small, noncommercial lots of fruits and vegetables moving by passenger vehicle, parcel post, freight, and express. Inspection centers for farm products are now concentrated in the heavily infested area where the beetles are particularly likely to infest unscreened refrigerator cars and motortrucks. These carriers furnish suitable conditions for survival of the adult during trips of considerable distance. Coincident with this modification, the road-inspection force stationed on the western border of the regulated area was reduced. Inasmuch as there is a heavy southbound truck movement of fruits and vegetables from the heavily infested area, the road-inspection stations on southern exit highways will be fully staffed. There will be 19 inspection centers set up in the area of heavy beetle flight--9 in Delaware, 1 in the District of Columbia, 4 in Maryland, 1 each in New York and Pennsylvania, and 3 in Virginia. There were no reports during May of adult beetle emergence in the field, although numerous reports were received of adult beetles being observed in unclassified greenhouses.

Summer fumigation of fruits and vegetables for Japanese beetle.--Preparations were being completed during May for the fumigation with methyl bromide of farm products in refrigerator cars, and the fumigation of empty cars with hydrocyanic acid prior to loading with certified products. The Pennsylvania Railroad Company has on hand a supply of methyl bromide in cylinders with 15-pound applicators, so that the more adaptable 1-pound cans cannot be used until the supply of cylinders is exhausted. A commercial concern is developing a simple and inexpensive can opener especially designed for opening cans of methyl bromide. As soon as a good working model is available tests will be made to determine its effectiveness. On May 27 a conference was held at Cape Charles, Va., with officials of the Pennsylvania Railroad and the Fruit Growers Express concerning arrangements for the inspection and fumigation of refrigerator cars containing fruits and vegetables destined to nonregulated territory from the Eastern Shores of Maryland and Virginia. It was decided that cars arriving by barge from Norfolk should be screened on the Cape Charles side if they arrived during the night or before 9 a. m. All cars that will arrive on the Eastern Shore after 9 a. m. or during the day are to be screened at Norfolk.

Sampling of lead arsenate treated plots completed.--Soil sampling of nursery plots treated with arsenate of lead for Japanese beetle control was completed this month, with the exception of resampling of plots that were replanted after the initial samples were lifted. The 750 samples taken this season are approximately 100 fewer than those collected last spring. This decrease is due principally to the abandonment of leaded plots and coldframes on a large nursery in central New Jersey. As soon as the analyses have been completed at the Moorestown, N. J., laboratory, the nurseries will be notified of the results. Present indications are that lead arsenate treatments will increase this spring. Because of lack of information as to the extent to which evergreens may be safely fumigated with methyl bromide and in view of some injury that has been experienced by growers who have fumigated certain evergreens, despite the lack of experimental results, many nurserymen will continue to treat plots with lead arsenate until more data have been obtained on the adaptability of methyl bromide for this type of nursery stock.

One in, and one out of Japanese beetle regulated area.--A large hydrangea grower in the Baltimore, Md., area has completed the consolidation of his Tennessee establishment with his present Maryland nursery, where he has started the erection of four new greenhouses. Establishment of the Tennessee branch of the nursery was for the purpose of avoiding the restrictions imposed by the Japanese beetle quarantine. Since development of methyl bromide fumigation, however, this grower has had an easy and satisfactory means of obtaining certification of all his plant material. Consequently maintenance of the Tennessee plantings is no longer warranted. During this same period, a nurseryman at Gray, Maine, has moved his entire young-evergreen nursery to an uninfested area in New York State, where a better type of soil is found for the growth of seedlings, and so that he could avoid the restrictions of both the gypsy moth and Japanese beetle quarantine regulations.

Soil treating at six isolated Japanese beetle infestations in Ohio.--A total of 84.75 acres was treated with lead arsenate at the rate of 500 pounds per acre in six Ohio cities in May. The largest acreage was treated in Belpre, where 21.9 acres was covered between May 8 and 17. At Conneaut, 17.6 acres was treated between May 20 and 31, the work continuing into June. Treating work, begun in Marietta on April 12, was completed on May 8, with a total of 19.6 acres treated in the city, 11.65 acres of which was covered in May. In Zanesville, 12.6 acres was treated from May 9 to 21. The work under way in Gallipolis since April 15 was terminated on May 6, with a total of 25.7 acres treated in April and 11.8 acres covered in May, for a total of 37.5 acres. Treating was still in progress in Ashtabula at the end of the month. From May 22 to 31, 9.2 acres was treated in this city.

Bulk shipments from nursery in New Jersey infested with Japanese beetle.--Four carloads, comprising approximately 750 evergreens, were dug and shipped under certification at one large New Jersey establishment. Half of these were fumigated with methyl bromide and the balance came from plots treated with lead arsenate. Several truckloads of plants were also moved from this property to Radio City in New York and to the New York World's Fair. About 75 men were employed by the nursery to clear off and burn unsalable stock from large blocks which had been standing for years. These plots will be replanted with young stock. Several large blocks of Taxus were being prepared for treatment with arsenate of lead for fall certification. Although carload movement of stock from this establishment dropped during May, business is reported as very consistent and equal to that of 1939.

Seasonal Japanese beetle trap program started.--Supplementing the few traps distributed in Florida during April, additional traps were distributed in 13 Florida localities in May. Trapping was also started in Atlanta, East Point, Fort Valley, Jonesboro, and Thomaston, Ga. In North Carolina traps were set in New Bern and Wilmington, and trap placement was under way in Goldsboro on the last of the month. A trap route was established in Charleston, S. C., on May 18.

Road-patrol activities.--Establishment of road-patrol stations, begun on April 15, continued through May 5. For most of May there were in operation 16 vehicular inspection stations--6 in Virginia, 1 in West Virginia, and 9 in Ohio. The inspection corps was comprised of 35 men. From uncertified plant material intercepted at the post during the month there were removed 55 larvae and 2 pupae of the Japanese beetle.

Japanese beetle certification of tourist purchases at Mount Vernon.--During the month ivy plants destined to 36 States were certified for the Mount Vernon Ladies Association, owners of the George Washington estate on the Potomac River. Considerable ivy and boxwood propagated from the original plantings on the estate are sold annually for shipment all over the United States.

Taxus weevil control supplemented for quarantine purposes.--A nursery in the New York City area, which has been treating a nursery block with arsenate of lead for taxus weevil control, has arranged for the analysis of the soil in the plot so that they may add enough of the insecticide to enable them to secure Japanese beetle certification of their plantings next fall and spring.

Gypsy moth egg clusters found on shipments from formerly permitted establishments.--In the Middletown, Conn., area, where many of the nurseries were formerly permitted after having been found free from either Japanese beetle or gypsy moth infestation, five gypsy moth egg clusters were removed from nursery stock shipped from this area under certification during the spring shipping season. Some of the infested shipments were destined to Illinois. Following the discovery in 1939 of gypsy moth infestation on or near several of these establishments, the permit arrangements were canceled and all stock from the nurseries in this shipping center was made subject to actual inspection prior to certification.

New England gypsy moth inspection results.--Among the hundreds of shipments submitted for gypsy moth inspection during the month were 16 containing gypsy moth egg clusters. Seventy-three egg masses were removed from these infested shipments. Four egg clusters came from nursery stock, 10 from a collection of native trees, and 59 from a dozen carloads of lumber. No extremely heavy infestations were found in any of this material. The greatest number taken from any one shipment consisted of 23 egg masses found on a carload of lumber inspected at Madison, N. H., for transportation to Brooklyn, N. Y. In addition, at Conway, N. H., 3 egg masses were removed from 1,200 wood novelties that were examined for later shipment under certification to points outside the infested zone.

New England nursery shipping season extended.--Because of continued cool weather and considerable rain during May, New England nurseries were able to carry on digging and shipping operations during the entire month. This was of considerable advantage to them as they had a late start. Ten temporary inspectors and one of the district inspectors in the Portland, Maine, district were assigned to a forest nursery in that area for a period of approximately 2 weeks to inspect and certify young evergreens. Approximately 2,150,000 trees were examined and certified. A total of 6,080 certificates was required to certify this material. The spring shipping season of this establishment was completed by the end of the month.

Peeling machine will facilitate pulpwood inspection.--The freight yard at Groton, Vt., was filled during the month with government-owned pulpwood. According to the freight agent there, it was estimated that 1,000 cords of this wood would be shipped from that point. Most of this wood still retains its bark. It is understood that a peeling machine will be used on the wood before it is shipped. This will make it possible to inspect the operation and certify any wood destined to points outside the gypsy moth regulated zone.

Dutch elm disease quarantine violation discovered in Connecticut.--On May 13, while at a private estate inspecting 1½ cords of fuelwood for shipment to New Jersey, the gypsy moth district inspector from Westerly, R. I., learned that 21 Chinese elm trees had been received on the property from New Jersey. An immediate investigation of this violation of the Dutch elm disease embargo was made. The landscape gardener who moved the trees to Stonington, Conn., from Caldwell, N. J., claimed that he was unaware of the restrictions of Quarantine No. 71 at the time he made the plantings. At the direction of the owner of the estate, the trees were destroyed on May 22 in the presence of the district inspector.

Bark-beetle emergence.--In Bucks County, Pa., beetles (Scolytus multistriatus Marsh.) were observed emerging and in flight late in the month. A few trees were noted in which the beetles had entered for breeding purposes. A check at the end of the month on beetle trap logs in the Pennsylvania infected zone showed that only a few of these had been slightly attacked. During the last week in the month a first inspection was made of the trap logs placed early in May in the Athens, Ohio, area. Beetles were found entering the logs. Most of the traps examined showed evidence of heavy beetle attack.

Difficult elm-sanitation assignment.--A Bucks County, Pa., sanitation crew was engaged during the month in the clear cutting of elms on a cliff in the "Narrows" along the Delaware River. This is a hazardous undertaking, since the cliff is nearly perpendicular at this point. One unit in Pike County, Pa., is working in a swamp in Porter Township, cleaning up elm debris left by a twister. Trees were broken off and uprooted in a swath 200 feet wide and 400 feet long.

First-record Dutch elm disease infection.--A first-record infection was reported from Bedminster Township, Bucks County, Pa., in May. This adds 33 square miles to the Pennsylvania infected zone.

FOREST INSECT INVESTIGATIONS

Ambrosia beetles being studied in New Jersey.--W. D. Buchanan, of the Morristown, N. J., laboratory, reports that adults of the introduced ambrosia beetle, Xylosandrus germanus (Bldfd.), began to be active in May. They began to issue in numbers from rearing containers in the laboratory yard on May 7 and a few days later females were observed entering elm, oak, sycamore, beech, and ash material in the field. Most of this material consisted of limbs broken from the trees in March as a result of a severe ice storm. In all cases the wood had remained moist because of being partly submerged in water or mud. Beetles were also found forming their galleries in exposed roots of beech and an undetermined tree, and boring into elm trees where the bark had been removed by horses or man. Mr. Buchanan has already shown that X. germanus can transmit the Dutch elm disease fungus (Ceratostomella ulmi (Schwarz) Buisman) under controlled conditions. It is rather difficult to rear the insect in the laboratory but barked elm sticks have been successfully attacked this year when kept in battery jars covered with pieces of glass. The lower ends of the sticks rested on wet sand.

Logging to forestall bark-beetle damage.--The Weyerhaeuser Timber Company, encouraged by the success of experiments at Black's Mountain in northeastern California, where the Bureau has demonstrated the possibility of controlling western pine beetle losses through advance removal of high-risk trees, has started a practical test of this control method in their ponderosa pine stands of southern Oregon, according to F. P. Keen, of the Portland forest-insect laboratory. A 1,000-acre tract has been set aside by the company for their first test of this control method. Many thousand additional acres will be covered next year if the method proves successful and economically feasible. Approximately 15 percent of the stand representing trees of the highest beetle risk are being marked for cutting by the Bureau's local forest entomologists. Logging of this timber will be done on a contract basis during the present summer. It is the opinion of the company's officials that this method holds more promise of successful beetle control than the old fell-peel-burn method on which they have been spending approximately $10,000 a year for the last 29 years.

Penetrating sprays to be given practical test.--J. C. Evenden, of the forest-insect laboratory, at Coeur d'Alene, Idaho, reports that a practical test of penetrating sprays as a means of controlling the mountain pine beetle in lodgepole pine was instituted on the Wasatch National Forest, Utah, on June 3. Past work has demonstrated the effectiveness of this treatment on controlled experiments, and this project will serve to test the practical value of the method as a means of control. This test will include the treatment of from 800 to 1,000 trees on an area of approximately 3,000 acres. The technical phases of this project will be under the direct supervision of officers of the Bureau of Entomology and Plant Quarantine, while the administrative phases will be handled by the Forest Service.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Preparations for gypsy moth spraying.--Work preliminary for the gypsy moth spraying season was speeded up early in May so that it could be completed before the foliage developed enough to permit spraying. Central locations in the field were made ready for the storage of spraying equipment and supplies, and the materials were later transported from the central storehouses to these selected locations and distributed as needed to the areas where spraying is to be done. One type of work that must be completed before spraying is started is the laying of hose lines from locations where the sprayers are to be set up at the water source to the most distant points to be sprayed, which may be several thousand feet from the sprayer. An example of the magnitude of this one item of work is the fact that it is estimated that about 145,000 feet of hose will be used in the Pennsylvania area alone, as many infestations to be sprayed are remote from the nearest supplies of water where the sprayers can be placed advantageously. By the end of the month the laying of the hose lines was practically finished, temporary fences around the areas to be sprayed were completed, the approaches to the streams and water holes where sprayers will be set up were repaired and improved, and initial supplies had been moved to the sprayer sites. Fortunately, there appears to be an abundant supply of water in streams and ponds from which water will be drawn during the spraying season. Large numbers of burlap bands were applied to tree trunks at infested locations where no spraying will be done this season. These bands will be turned at regular intervals during the larval season and all caterpillars found taking shelter beneath them will be crushed.

Development of foliage retarded by late spring.--Although the foliage appeared to be fairly well advanced by the middle of May in the valley areas, such as the southern Connecticut River Valley in western New England; the Hudson River Valley in eastern New York, and the Susquehanna River Valley in eastern Pennsylvania, the development of vegetation, in general, indicated a late spring. In wooded country at moderate elevations most of the trees were foliating very slowly, and there seemed to be little likelihood that spraying could be started in many areas before June 3. As oak trees, which are among the most favored food plants of the gypsy moth, are the last to produce leaves, it is usually advisable to delay the spraying of areas where this type of growth comprises a substantial part of the stand until the foliage is at least half developed.

Scouting work completed in Vermont.--Gypsy moth scouting in the barrier zone section of Vermont was drawing rapidly to a close by the middle of May. The work was finished in the areas around assembling cages that attracted male gypsy moths last summer in Leicester Town, Addison County, no indications of the presence of the insect being found. However, a crew continued work in a woodland tract bordering an infested area in Brandon Town, close to the Leicester Town line, as there is a possibility that the Brandon infestation may extend into the woodland in Leicester. Work around assembling cage sites in Lincoln Town was also completed with negative results. All scouting work planned for this fiscal year in Middlebury, Addison County, where more than 200 gypsy moth egg clusters were found and destroyed, was finished, as was the work in the adjoining town of

Bristol. The southern half of the town of Troy, Orleans County, one of the northernmost towns in the State, was scouted without the discovery of any sign of the gypsy moth, and the crew was moved into the adjacent town of Westfield, which was inaccessible until recently because of snow-blocked or muddy roads.

Control of new infestation in Vermont proves difficult.--A gypsy moth infestation was discovered early in May about 1,700 feet from the site of an assembling cage where one male gypsy moth was taken last summer in Salisbury, Addison County, Vt. The growth at the center of the infestation is chiefly medium-sized hardwoods, consisting mainly of paper birch, red and white oaks, beech, and hard maple. The moderate amount of ground litter present can be readily cleaned up, but a bad tangle of slash and other deadwood left from old logging operations covers a large area a few hundred feet from the apparent center of infestation in the same wood lot.

Barbwire fences erected in preparation for spraying.--Government-owned barbwire fences were removed from areas which were sprayed last year in Shrewsbury, Rutland County, Vt., and the wire was used in erecting temporary fences around infested woodland in Addison County, where spraying will be done during the coming season. Some of the woodland where spraying will be done in Bristol and Middlebury, in Addison County, either embraces or is surrounded by areas where young stock will be pastured until fall or early winter. In such cases, stout temporary fences will be erected around the areas to be sprayed to prevent the livestock from grazing on the poisoned vegetation. These fences will be patrolled at frequent intervals, especially after storms, and any damage resulting from windfalls, lightning, or tampering will be repaired at once.

Two new gypsy moth infestations found in Connecticut.--Two new gypsy moth infestations were found in the town of Cornwall, Litchfield County, Conn., early in May. One of these colonies is located at a relatively high elevation in growth largely favored as food plants by the gypsy moth. Work at this spot was pressed in order to determine the advisability of treatment by spraying.

Planned treatment work at Southbury infestation not completed.--Although scouting and treatment work at the gypsy moth infestation situated on the Southbury-Roxbury Town line in New Haven and Litchfield Counties, Conn., was conducted in an intensive manner in order to locate and creosote a maximum number of egg clusters before hatching becomes general, it became apparent early in May that this phase of the work would have to be discontinued before entire completion. It was necessary to withdraw some of the men from the scouting and treatment work and assign them to the building of temporary fences around the infestation in preparation for the approaching spraying season. A special type of fence consisting of 11 strands of barbwire, placed about 4 inches apart and supported by posts every 3 feet, was erected at this infestation so that sheep pastured on adjoining land cannot force the strands apart and crowd into the poisoned area.

Preliminary gypsy moth work in Pennsylvania completed.--The general plan of scouting work for the fiscal year in Pennsylvania has been followed closely and will be practically completed by the time spraying is begun. The work was so far advanced that, by the middle of May, several crews of laborers were engaged in applying burlap bands to trees at infested locations where no spraying is planned for this year. These bands will be patrolled regularly and all caterpillars found under the bands will be destroyed. Other crews were assigned to the erection of temporary fences around woodlands where spraying will be done. Some of these fences were completed in sections where fenced pastures are rarely seen and where livestock is permitted to roam over the countryside at will.

Residential spraying started in Pennsylvania.--Residential spraying for the gypsy moth in Pennsylvania was begun on May 21, several days later than the work is usually started, with six machines operating. Each sprayer was closely followed by another loaded with clean water, which was used to wash the lead arsenate solution from buildings, fences, garden furniture, and other material. Every precaution was exercised to avoid damaging property or injuring shrubs and young plants in gardens. Work was first started in sections where birches, Norway maples, and Carolina poplars predominated, as the foliage on these trees was more advanced than on other species. Meanwhile, employees were engaged in distributing supplies, laying out hose lines, finishing the construction of temporary fences, and improving the approaches to streams and water holes where sprayers will be set up in other sections of the quarantined area. This work was practically completed by May 25.

C. C. C. gypsy moth work during May.--Approximately 7,375 6-hour man-days was used by the C. C. C. during May on gypsy moth work under the supervision of this Bureau in the area east of the barrier zone. Heavy rains during the month were responsible for much time lost to gypsy moth work, while the training of enrollees in fire fighting caused further reduction. The men were used mainly on scouting, creosoting, thinning, and burning operations until the hatching of the egg clusters was practically complete. Owing to a decrease in the regular Federal gypsy moth force, it was necessary that C. C. C. foremen transport the spraying machines and hose from the storehouse in Greenfield, Mass., to the field. This was done and the hose lines had been laid in readiness for operation by the end of the month. Also fences, roads, and water holes were prepared for the spraying season. Actual spraying work was started at several locations east of the barrier zone in Massachusetts and Connecticut on May 27. As there was considerable variation in the extent of development of white oak foliage, spraying was started in areas where there was a minimum amount of this type of growth in regions where the foliage was not sufficiently developed. The late season permitted the continuance of scouting work in Vermont until the end of the month, and the crews continued to find severe infestations in the Rockingham-Westminster-Grafton-Springfield areas. As no spraying equipment is available for C. C. C. gypsy moth spraying in Vermont, the gypsy moth crews will be assigned to burlapping and thinning work during the larval season.

Gypsy moth hatching retarded.--Gypsy moth hatching started late this season and was spread over an unusually long period. Emergence was first noticed by C. C. C. foremen in the vicinity of Westfield, Mass., on May 8, and very heavy hatching was observed in the Rockingham section of Vermont as late as May 23.

C. C. C. spraying preparations.--Scouting work in Massachusetts and Connecticut has disclosed that the supplies, equipment, and supervision available are not sufficient to cover all territory where spraying could be done advantageously, and it will be necessary to confine the spraying operations to the areas considered most dangerous. Nine Bureau-owned sprayers, which were loaned to the C. C. C. for gypsy moth spraying work, were distributed and set up ready to start operations. Four of the machines will be used east of the barrier zone in Massachusetts and five will operate in Connecticut. The work in Connecticut will be augmented by two additional sprayers loaned by the State. The sprayers in Connecticut will operate on a double-shift basis after June 3, and the purchase of additional lead arsenate and fish oil by the C. C. C. in Massachusetts will permit double shifts on three of the Massachusetts sprayers. The work in Massachusetts will be done entirely by C. C. C. foremen and crews, and regular Federal employees have instructed the spray-pump operators and nozzlemen as to the proper manner to carry on this work. Spraying in Connecticut will be done cooperatively by the C. C. C. and the State gypsy moth office. This office has loaned a considerable part of its force to aid the C. C. C. spraying work, and the pumps will be operated by State employees, while C. C. C. enrollees will man the nozzles. Through further cooperation by the State forester of Connecticut, experienced C. C. C. gypsy moth foremen and enrollees have been transferred from camps where no spraying is to be done this year to other camps where spraying work is planned. This realignment of foremen will place C. C. C. foremen who are familiar with gypsy moth spraying in charge of most of the spraying crews. In a few instances where this arrangement is not possible, experienced State foremen will direct the crews through C. C. C. leaders acting as foremen. Excellent cooperation has also been given by many property owners.

PLANT DISEASE CONTROL

Stem rust in Mexico in the spring of 1940.--The following summary of the stem rust situation this year has been compiled by E. C. Stakman, in charge of the Federal rust laboratory at St. Paul, Minn.: "Stem rust was found on wheat in all major wheat-growing areas visited in Mexico late in March and early in April. In southern Mexico, including the States of Puebla, Mexico, Michoacan, Jalisco, Queretaro, and Guanajuato, the development of rust was somewhat sporadic, its prevalence and severity varying greatly in different localities and in different fields in the same locality. Owing to an unusually cold, dry winter, the availability of irrigation water appeared to be an important factor in this uneven distribution of rust. As in previous years, early sown fields were most heavily rusted and there was relatively little evidence of extensive spread from fields in which rust survived the winter. Identification of parasitic races of wheat stem rust from southern Mexico is in progress. Preliminary evidence indicates predominance of race 38 and race 59, as in previous years, although there are some indications of small amounts of races not hitherto present or prevalent in that region. In northern Mexico, including the States of Nuevo Leon and Coahuila, rust development was extremely local. Only a few pustules were found in the Torreon area early in April and rust was still light the third week of May. In the Saltillo area there was no rust or relatively little in most fields early in April, but eastward near Ramos Aerizpe some early fields were heavily rusted. Just south of Monterrey and also near Sabinas Hidalgo, about 80 miles south of the international boundary, some fields were heavily rusted. Heavy rain late in March favored abundant development of rust in this area, and spores undoubtedly were blown into Texas from it. Had this rain not occurred at that particular time, there would have been only a moderate amount of rust. Preliminary results of physiologic race identifications from northern Mexico indicate that the situation again is different in general from that in southern Mexico."

Stem rust situation in Southern States.--There is evidence that overwintering of the uredial stage in Texas was rare during the winter of 1939-40. Apparently, however, a few spores were blown in from Mexico at various times during the winter and considerable numbers were blown in during the spring. This conclusion is reached by correlating the appearance of rust with the results of spore trapping. Because of the very dry fall and winter in much of the hard red winter-wheat area, there is much late wheat, as was true in 1935. Frequent rains this spring were favorable to rust development and there is likely to be considerable damage. In a fan-shaped area extending northeastward and northwestward from Dallas, Tex., considerable damage already has been done. The aecial stage of rust on barberries was prevalent from Pennsylvania and the Virginias to Minnesota and Iowa by the second half of May, and many collections have been obtained for physiologic race identification.

Wind dissemination of spores.--Slides exposed at many stations in the Mississippi Basin are being examined as rapidly as possible. Considerable numbers of spores were blown into the region around Dallas, Tex., during the first week of April and larger numbers at various times later in the month. By the 21st of April a moderate number of spores were caught at Wichita, Kans.

Physiologic race survey.--There are now on hand 238 uredial collections, of which 46 have been identified. There are 44 aecial collections, all of which are in culture but none of which have been identified. About 150 of the uredial collections are now in culture.

The production of new races of stem rust on barberry bushes.--From a study of rust produced on barberries by inoculating with teliospores and from the results of crossing experiments, it is becoming increasingly evident that Puccinia graminis tritici, inferentially other varieties also, comprise an indefinite number of parasitically different biotypes. At least some of the recognized and numbered races clearly comprise several biotypes, with slight to rather pronounced differences in virulence to wheat varieties. It is significant that the resistance of certain varieties to certain physiologic races may vary greatly with environmental conditions. Although the importance of eradicating barberries to prevent the development of new races and to help reduce the number now in existence has been emphasized repeatedly, observations and experiments during the last few months impel to still greater emphasis.

More Berberis canadensis found in Indiana.--Stanley Castell, State leader of barberry eradication in Indiana, reports: "A new location of Berberis canadensis has been found in Washington County. These bushes were reported by a boy who learned about barberry from a lecture in his school by an agent on the barberry-eradication campaign several years ago. This find is the third one reported by this boy. The bushes were salted on May 24, 1940."

Barberry bushes found in North Dakota, South Dakota, and Montana.--According to G. C. Mayoue, G. W. Eade, and Ivar Twilde, barberry bushes have been found in North Dakota, South Dakota, and Montana since field work was resumed in these States about April 1. In North Dakota a former security-wage employee reported the presence of barberry bushes near Sanger, Oliver County. A check of the report resulted in the eradication of 16 large barberry bushes and many seedlings. According to the owner of the property, the barberries were the remainder of a hedge of more than 100 bushes planted by his mother in 1904. The farm on which the bushes were found is located about a mile from the Missouri River and it is expected that wild bushes may be found in adjacent wooded areas. In Montana barberry bushes were found in May in Carbon and Missoula Counties. In South Dakota a crew of security-wage earners, under the supervision of a technically trained supervisor, have found bushes in Fall River County.

White pine plantations will be pruned to reduce rust loss.--Parts of 2 white pine plantations on the middle fork of Big Creek near Haugan, Mont., are scheduled for pruning by C. C. C. workers this fall and winter in order to reduce the loss from blister rust that invaded the areas prior to Ribes eradication. These plantings, which are about 15 years old, average about 200 planted and native white pines per acre in a strip 10 chains wide along the lower slope where the work will take place. In addition, there is a scattering of natural larch and Douglas fir which, with the white pine, will develop into a full ground cover within the next decade. The plan, as approved by Elers Koch, chief of timber management for region 1, is as follows: (1) Prune branches from lower third of all white pines; (2) remove all trees with trunk cankers; (3) remove cankered branches from the upper two-thirds of the crowns; (4) release all white pines that are crowded by other conifers, willow, and minor brush. From general observation it appears that removal of the lower third of all crowns will destroy 95 percent or more of the cankers on the area. Probably not more than 2 percent of the trees are doomed by cankers already in the trunk, so the present loss is very light. Cankers that would eventually reach the trunks and kill, however, constitute a high percentage of the total, so it is estimated that this relatively low-cost pruning job will save from 50 to 75 percent of the white pine. Two other plantations in this general vicinity are also under consideration for rust-loss-reduction treatment.

First infected limber pine in Northwest.--For the purpose of checking on blister rust invasion of the Savenac Nursery at Haugan, Mont., a row of western white pine is maintained in the odd-stock plot on the old nursery site. A small amount of infection, probably from a few nearby Ribes removed during rework in 1938, was found recently on two of these trees. Further inspection on May 31 by nurserymen J. Fox, C. H. Johnson, and E. L. Joy resulted in the location of five additional cankers on western white pine and three on limber pine in an adjacent row. The latter consisted of one fruiting canker and one incipient canker on 1936 growth and one on 1937 wood. Although occurring on nursery-grown stock within the nursery area, this constitutes the first reported infection of Pinus flexilis in the Northwest.

Pine infection found in Iowa County, Wis.--Blister rust infection on white pine was reported for the first time in Iowa County, Wis., this spring. The canker was found on 1936 wood. Of some 200 trees examined, rust was found on only 1 tree about 3 feet in height. Ribes cynosbati and R. missouriense were growing in the immediate vicinity. This location is approximately 28 miles north of the Illinois-Wisconsin State line and the most southern infection of pine found in Wisconsin.

COTTON INSECT INVESTIGATIONS

Cotton root aphids.--F. F. Bondy and C. F. Rainwater, Florence, S. C., conducted experiments during April and May against the cotton root aphids through control of the attending cornfield ant Lasius sp. . Three species of root aphids were found on cotton but every case of severe injury observed was caused by Trifidaphis phaseoli (Pass.) and this is by far the most important species on cotton. Vetch, clover, and cowpeas appear to be the principal host plants of this species. A few aphids were on the roots of Austrian peas during the winter but none were found this spring and it does not appear to be a favorite host. Cotton following corn planted to cowpeas is often heavily infested. A great deal of interest has been shown by biologists of the Soil Conservation Service in planning crop rotations to reduce aphid damage to cotton. The ant poisons tested this season were thallium acetate, thallium sulfate, and tartar emetic in sweetened baits. These were distributed in Argentine ant bait cans, or absorbed in sawdust and cottonseed hulls. A small handful of the latter was placed about every 10 feet on each third row of cotton, or at the rate of 1.5 to 2 gallons of sirup and 8 pounds of cottonseed hulls or sawdust per acre. Good reductions in the number of ant hills and the aphid injury to cotton were obtained with all the baits. The tartar emetic-cottonseed hull bait will likely be the most practical, because of its greater safety and the availability of materials. Its effectiveness is lost after a few days and the bait placed in cans would remain effective over a longer period, although in either case more ants are attracted within the first 24 hours. It was also observed that more ants attended the baits on bright warm days following cool nights and more following a warm rain than during a dry spell.

Effect of boll weevil control insecticides on leaf aphids.--In many cases Aphis gossypii Glov. increases to injurious numbers following the use of calcium arsenate for boll weevil control and complicates the interpretation of results. Studies were made at Tallulah, La., by R. C. Gaines, M. T. Young, and G. L. Smith to obtain information on the effects of certain insecticides used for boll weevil control on the aphid infestation and the injury caused by the aphids. Aphid counts were made by examining 1 square inch of leaf area on the fourth leaf from the top of 100 cotton plants per plot. These records were made without removing the leaves from the plants, on 5 or 6 dates during the period July 26 to September 1. In plots dusted with calcium arsenate containing 10.3 percent water-soluble arsenic pentoxide, by the New York method, an average of 1.95 aphids per square inch were found; dusted with 4.6 percent water-soluble calcium arsenate, 1.84 aphids; dusted with 0.5 percent water-soluble calcium arsenate, 1.40 aphids; check, 0.45 aphid per square inch. The plots treated with the calcium arsenates

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containing a low percentage of water-soluble arsenic yielded 66 pounds of seed cotton per acre more than the plots treated with the high percentage of water soluble. The significant difference in aphid populations may be partly responsible for the difference in yield, since cage tests have indicated that calcium arsenate containing a high percentage of water-soluble arsenic was more effective and toxic against the boll weevil than one containing a low percentage. In another series of experiments plots dusted with di-calcium arsenate which was practically pure $CaHAsO_4.H_2O$, there were an average of 3.65 aphids per square inch of leaf area; dusted with a calcium arsenate containing 3.4 percent water-soluble, 2.32 aphids per square inch; dusted with a 7-percent paris green and 93-percent calcium arsenate mixture containing 2.6 percent water-soluble arsenic, 2.17 aphids; dusted with a calcium arsenate containing 0.35 percent water-soluble arsenic, 1.98 aphids; dusted with basic copper arsenate, 1.27 aphids; and check, 0.48 aphid per square inch. The yields from these plots fall into two groups, those from the di-calcium arsenate and the paris green-calcium arsenate mixture being lower than the check and the 2 calcium arsenates and basic copper arsenate higher than the checks. The difference between the average yields in the 2 groups was 148 pounds of seed cotton per acre. The difference between the lowest yield, which was from the di-calcium arsenate, and the highest, which was from the basic copper arsenate, was 249 pounds per acre. Aphid infestations appeared to partly explain these differences in yield as there were light boll weevil infestations in all plots and only small differences in boll weevil infestations between the various treatments. The coefficient of correlation between the average number of aphids per square inch of leaf area and yield, with checks included, was -0.52 (P more than 0.10) and without the checks the coefficient was -0.92 (P approximately 0.02). The correlation coefficient between the average number of aphids per square inch and net mortality of boll weevils in cages was +0.99 (P more than 0.01). These coefficients leave little doubt as to the relation between aphid infestations and effectiveness of insecticides for boll weevils and between aphid infestation and yields. A 3-percent nicotine sulfate-lime dust for aphid control and a calcium arsenate containing 3.5 percent water-soluble arsenic for boll weevil control were used in a factorial experiment to determine effect of aphid control on yield, the effect of boll weevil control on yield, and the effect of a combination of both aphid and boll weevil control on yield. A highly significant average increase of 190 pounds of seed cotton per acre was caused by boll weevil control, with and without aphid control, while a nonsignificant average increase of 90 pounds was caused by aphid control, with and without boll weevil control. In the absence of aphid control a nonsignificant average of 140 pounds per acre was caused by boll weevil control, while with aphid control the average increase of 230 pounds was significant. In the absence of boll weevil control the average increase caused by aphid control was 40 pounds per acre, while with boll weevil control the average increase was 130 pounds, both differences being nonsignificant. A highly significant average increase of 270 pounds per acre was caused by the combination of both boll weevil and aphid control. In other experiments comparing calcium arsenate, sulfur, and mixtures of calcium arsenate and sulfur, no significant differences were found between the averages of the aphid populations in the checks and the sulfur-treated plots or between the calcium arsenate and calcium arsenate-sulfur mixture plots, which indicate that sulfur apparently had little or no effect on the aphid infestation. The significant differences between numbers of aphids in plots treated with calcium undiluted or diluted with sulfur and where no calcium arsenate was used, indicated that calcium arsenate was the only material used in this series which greatly affected aphid infestation.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Bloom inspection.--The principal method for obtaining information in regard to the status of pink bollworm infestation is through gin-trash inspection. Bloom inspection is usually done for a short period each year early in the season in order to obtain advance information in regard to the existence of infestation. At the close of the second week in May a considerable acreage of 1940 cotton plantings was beginning to put on blooms in all 4 of the lower Rio Grande Valley counties and in the Matamoros area of Mexico, and cooperative bloom inspection was begun on May 13 by the Control and Research Divisions of this Bureau and the Defensa Agricola of Mexico. The first pink bollworm was found in a cotton bloom in the Matamoros area on May 13, and in Cameron County, Tex., on May 15. At the close of May a total of 852,262 blooms had been inspected from 6 south Texas counties and from the Matamoros area of Mexico, resulting in the finding of 79 pink bollworms. Of the total number of pink bollworms found, 46 came from the Matamoros area through the examination of 282,202 blooms; 32 came from Cameron County through examination of 417,464 blooms; and inspection of 133,483 blooms in Hidalgo County yielded 1 specimen. Bloom inspection in the other 4 Texas counties, namely, Willacy, Starr, Jim Hogg, and Duval, gave negative results as to pink bollworm infestation.

Inspection of okra in lower Rio Grande Valley.--Following the finding of a rather widespread pink bollworm infestation in okra fields in the lower Rio Grande Valley area at the close of the 1939 cotton season, the State of Texas issued a proclamation establishing rules and regulations pertaining to the production and movement of okra, designed to prevent spread of infestation through this medium, and Federal Quarantine No. 52 was also amended to include okra in the list of products under regulation on account of the pink bollworm. The spring okra-shipping season in the lower valley opened around the first of May, and there was unusual activity in connection with okra plantings during the period. This was due, to a large extent, to the very good price being paid for this commodity, resulting in all available okra being gathered and sold. At the close of the month 137 dealer-carrier permits had been issued to valley growers, involving approximately 400 acres. Since the beginning of okra inspection, around the first of May, 116,145 forms have been examined, which is a great deal more than the total of all inspections in last fall's okra crop, with negative results as to pink bollworm infestation.

Destruction of sprout cotton in the lower Rio Grande Valley.--In connection with the control measure restricting the planting of cotton in the lower Rio Grande Valley counties to the period February 20 to April 20, it has been equally as important to prevent, insofar as possible, the blooming of sprout or volunteer cotton during the off cotton-growing season, in order that emerging pink bollworm moths would find no material on which to maintain themselves and build up infestation prior to the fruiting of the 1940 cotton crop. To prevent the fruiting of such plants, which usually are scattered, it is necessary to remove them by grubbing. No grubbing was done in May in fields in which 1940 cotton was planted, as by the beginning of the month the 1940-planted cotton was as far advanced as any remaining sprout cotton; however, some work was done during the period on abandoned acreage and along canal banks and drainage ditches. The removal of sprout cotton was discontinued on all acreage at the end of May. Since this activity was started on January 2, 1940, there has been a total of 94,060 acres of cotton land grubbed. In addition to this, sprout cotton was removed from 470 miles of canals and drainage ditches.

Destruction of stub cotton in Arizona.--As the result of cooperative efforts of the State of Arizona, the Bureau of Entomology and Plant Quarantine, and the Agricultural Adjustment Administration, regulations were promulgated by the Secretary of Agriculture in March 1940, through the A. A. A., requiring cotton growers throughout the State of Arizona having A. A. A. allotments to destroy all volunteer or stub cotton prior to May 10, in order to be eligible for 1940 conservation payments. This regulation has for its purpose the creation of a host-free period for the pink bollworm until the 1940-planted cotton comes into bearing, during which period all emerging moths will die in the absence of any cotton fruit, and has as its ultimate objective the eradication of the pink bollworm from Arizona. A similar provision was included in the A. A. A. 1939 conservation program, but included only the eastern portion of the Salt River Valley and the Santa Cruz Valley. The existing regulation also differs from the previous one in that it will remain in effect until revoked. The stalk-destruction program was carried to a very successful conclusion, and at the close of May 10, all growers having an A. A. A. base were in compliance with the Secretary's regulation. There did remain, however, approximately 800 acres having no A. A. A. allotment on which stub cotton was growing. Most of this acreage was made up of scattered plots on the U. S. Indian Reservation, from which there appeared to be no authority to effect the removal of stub cotton. Therefore, in order to safeguard the program, it was necessary to destroy this cotton with Bureau funds, and at the close of May sprout cotton had been removed from practically all of this acreage.

Control program in the Big Bend.--A very marked reduction in pink bollworm infestation in the heavily infested area of the Big Bend of Texas and Mexico was obtained under a joint international program carried out for that region during 1938 and 1939. Therefore, in order to maintain the reduction effected, and with the hope and expectation of further reducing the infestation, agricultural officials of both countries agreed on a similar program for the 1940 crop season for the Presidio-Ojinaga areas of the Big Bend. These control measures consist of the early clean-up of cottonfields after harvesting, coupled with delayed planting and the elimination of sprout cotton for the purpose of creating a host-free period for pink bollworm moths until the peak of spring emergence is over. No cotton was planted in the Presidio Valley prior to April 20, in compliance with a State order to that effect, and all planting was expected to be completed around May 10. However, on May 8 a severe hail and rainstorm occurred in that area, making it necessary to replant about 700 acres of cotton. Despite the fact that replanting was not completed until around the latter part of the month, unusually cool weather during May so retarded the growth of the earlier planted cotton that apparently it will reach maturity much in advance of the replanted cotton. While there was not a great deal of sprout cotton present in the Presidio Valley, scattered plants were found in nearly every field. At the end of May, however, all sprout cotton had been removed from the valley, with the exception of a small acreage which had not reached a favorable stage of development for removal. Similar control measures in the Ojinaga area of Mexico are being very successfully carried out, and the inspector in charge of that area reports excellent cooperation on the part of the farmers in complying with the order for the removal of sprout cotton.

Wild-cotton eradication in Florida.--An effort has been under way for a number of years to eradicate the pink bollworm from southern Florida through the destruction of its host plant, wild cotton, and thus prevent its spread into domestic cotton plantings to the north. Wild-cotton eradication in Florida is now nearing completion for the season, as, on account of unfavorable climatic conditions, it is not possible to carry on this work after the middle of June. At the close of May practically all of the area had been cleaned twice this season and in a considerable portion of the area third cleanings were drawing to a close. During the period approximately 3,390 acres was covered, resulting in the finding of 164 plants with mature bolls, 15,044 seedling plants, and 244 mature plants. During the month incidental inspections were made of 130 wild-cotton squares, 83 blooms, and 2,056 bolls. Most of the bolls were collected from the Dade County mainland, east of Cape Sable, the examination of which resulted in the finding of 2 specimens of the pink bollworm. Inspection of all other material gave negative results.

Thurberia-plant eradication.--The Thurberia-plant eradication project was inaugurated in 1935, following the discovery that these plants serve as a host to the Thurberia weevil, from which this insect was making its way to domestic cotton plantings in southern Arizona. The area involved in the original program for the removal of Thurberia plants included all of the Tortillita Mountains and the southern slopes of the Santa Catalinas. The Tortillita Range has been covered twice, and a recheck has been in progress for some time in the Santa Catalinas. During May a total of 1,976 man-days was expended on this work, resulting in the location and destruction of 21,591 plants from 4,320 acres.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Relation between viability of wireworm eggs and relative humidity.--As a result of recent experiments, E. W. Jones, of the Walla Walla, Wash., laboratory, reports that when eggs of the Pacific coast wireworm, the western field wireworm, and the sugar beet wireworm were exposed to relative humidities ranging from 80 to 100 percent, at a temperature of 68° F., the eggs shrunk and collapsed after 10 days' exposure to a relative humidity of 99 percent. The eggs of Limonius canus failed to hatch at a relative humidity of 98 percent and only 1 egg out of 50 hatched at a relative humidity of 99 percent. The eggs of L. infuscatus and L. californicus hatched when exposed to a relative humidity of 99 percent and the resulting larvae survived a 10-day exposure to this humidity. In general, it was found that of the 3 species the eggs of L. canus were the most susceptible to atmospheric conditions below the saturation point. The results of these experiments indicate that the present recommended practice of drying out wireworm-infested soils through the medium of withholding irrigation water or by growing a crop that requires large quantities of soil moisture affects not only the wireworm larvae but also the eggs, and that, in this event, L. canus would apparently exhibit the least resistance to the harmful effect of a deficiency in soil moisture on subsequent wireworm population.

Derris-pyrethrum-sulfur dust mixture effective against bean leaf beetle and associated insects on beans.--L. W. Brannon, of the Norfolk, Va., laboratory, reports that preliminary results of an experiment conducted for the control of the bean leaf beetle on snap beans showed that a derris-pyrethrum-sulfur dust mixture is highly toxic to this insect, one application of the dust mixture resulting in the death of approximately 91 percent of the insects at the expiration of a 24-hour period after the insecticide was applied. The results obtained with this insecticide are of considerable importance in view of its value as an all-purpose dust mixture for the combined control of several species of insects commonly attacking beans, including the Mexican bean beetle, the bean leaf beetle, the potato leafhopper, the common red spider (Tetranychus bimaculatus Harvey), and for the prevention of powdery-mildew disease. Examinations 7 days after the insecticide was applied demonstrated a reduction of approximately 60 percent in the number of bean leaf beetle adults on plots treated with this material, as compared with the population of this insect on untreated plots grown under comparable conditions.

Limitations in fumigation of mushroom beds with hydrocyanic-acid gas.--A. C. Davis, of the Beltsville, Md., laboratory, reports that the fumigation of bearing mushroom beds with hydrocyanic-acid gas, generated from calcium cyanide at intervals ranging from 6 to 8 days, and with dosages ranging from 2½ to 4 ounces per 1,000 cubic feet, did not damage the spawn, as demonstrated by the fact that more mushrooms were produced in the treated sections than in an untreated section grown under comparable conditions. At dosages exceeding 2½ ounces per 1,000 cubic feet it was found that some browning of the mushrooms occurred, as well as at slightly lower dosages. Temperatures above 55° F. were found to be less important than moisture, as a factor affecting the burning or browning of the mushrooms. The peak concentration of the hydrocyanic-acid gas was found to range from 0.153 mg./L to 0.62 mg./L, a difference of nearly ½ mg./L, with the same dosage of 2½ ounces per 1,000 cubic feet, owing to differences in moisture and humidity which, in the ordinary mushroom house, are difficult or impossible to control accurately. Based on the results of these experiments, it appears that under commercial conditions the material used in these experiments is too erratic to be entirely dependable, although the commercial practice of using 2 ounces of calcium cyanide per 1,000 cubic feet would probably not result in appreciable damage to the mushrooms under average conditions, even though it is the opinion of some mushroom growers that fumigation with hydrocyanic-acid gas generated from calcium cyanide is harmful to the mushroom spawn, and several growers have reported that the mushrooms upon the beds were severely damaged by the treatment.

Asparagus beetle parasite shipped from Washington to California.--During the month of May, B. J. Landis and his associates at the Puyallup, Wash., laboratory sent to the California Citrus Experiment Station at Riverside, Calif., 2,000 adults of *Tetrastichus asparagi* Crawf., a parasite of the asparagus beetle, for release in the asparagus fields of Orange County, Calif., where the eggs of *Crioceris asparagi* were numerous. Additional shipments are to be made from Puyallup to Riverside later in the season.

INSECTS AFFECTING MAN AND ANIMALS

Cushing to take charge of Menard, Tex., laboratory, center of screwworm and other work.--In order more effectively to coordinate the research on screwworms and to utilize the facilities available at the ranch experiment station of the Bureau at Menard, Tex., all work on screwworm problems is being centered at that point, and E. C. Cushing has been placed in charge. The investigational work on the screwworm problem, which has been carried on at Dallas, Tex., under the direction of E. W. Laake, is being transferred to Menard, together with some of the personnel. Mr. Cushing will also direct such work as is continued at Uvalde, Tex. The laboratory at Sonora, Tex., where investigations of goat and sheep lice, sheep head bot, amd sheep tick have been carried on, is being discontinued and O. G. Babcock will continue this work at Menard.

Stage to become assistant Division leader.--On July 1, H. H. Stage, in charge of the Portland, Oreg., office will report to Washington to fill the vacancy of assistant division leader occasioned by Mr. Cushing's transfer.

Longevity of Aedes eggs.--In 1935 Mr. Stage placed soil containing eggs of *Aedes vexans* (Meig.) and *A. lateralis* (Meig.) in a screened cage out of doors. The eggs had been oviposited in 1934 or earlier. On the first of June, and again on the first of September of each year since installation, samples of this soil have been tested for larval hatch and larvae of both species have appeared at each test. The June 1940 test has just been completed and the mean average hatch per sample was found to be 14.3. The previous tests in June showed the following averages: 1935, 370.0; 1936, 232.8; 1937, 62.5; 1938, 104.2; 1939, 159.5.

Breeding studies of Stomoxys.--At the Panama City, Fla., laboratory E. E. Rogers tested several sea flora as breeding media for *Stomoxys* but only one proved satisfactory. This was composed of a mixture of two green marine grasses tentatively determined as *Halodule wrightii* and *Ruppia maritima*. This is the first green material of this type observed on the beaches since work was started at this laboratory last September. A high percentage of emergence took place from this material.

Overwintering of Dermacentor variabilis eggs.--At the Martha's Vineyard laboratory Carroll N. Smith, in the course of observations on the duration of the developmental stages of the American dog tick under outdoor conditions, found one egg mass in which hatching had begun last fall but was stopped by winter weather and resumed in May. Three groups of larvae in which winter had interrupted molting resumed molting but no new lots of eggs or larvae were observed to start hatching or molting in this month.

Survey of malaria research.--A meeting in Atlanta on May 1 of several investigators working in the field of malaria was attended by W. V. King. This was preliminary to a more general conference called by the Surgeon General of the U. S. Public Health Service in Atlanta on May 29-30, which was attended by representatives of most of the organizations doing research on malaria and by several State health officers. F. C. Bishopp and W. V. King represented this Bureau. The present needs in the field of malaria research were discussed from many angles and a motion was adopted to conduct a survey of the research work on malaria now being carried out by different institutions and to determine the facilities available for such work. An outline was also prepared and adopted covering the various lines of research which, it was believed, should be given special attention and included in a coordinated program on this problem.

Pyrethrum emulsion and sand fly larvae.--J. B. Hull reports that during the last month at the St. Lucie, Fla., laboratory an emulsion composed of pyrethrum, kerosene, and soap, such as is recommended for mosquito larvae, was tested for its effect on sand fly larvae. The emulsion was made at the strengths recommended for mosquito larvae, except that the pyrethrum extract used contained 2 pounds of pyrethrum powder to 1 gallon of kerosene, instead of 1 pound of pyrethrum powder to 1 gallon of kerosene. Tests made with extract containing 2 pounds of pyrethrum powder to 1 gallon of kerosene, which is twice as strong as emulsion used for mosquitoes, gave a kill of 100 percent of sand fly larvae in 24 hours at a dilution of 1 to 10,000. At a dilution of 1 to 100,000, this gave no kill in 24 hours, although the larvae appeared very sluggish and were irritated.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--A living larva of the fruitfly *Anastrepha mombinpraeoptans* Sein was intercepted at New York on July 20, 1939, in a mango fruit in baggage from Puerto Rico. Living specimens of the pentatomid *Mormidea collaris* Dall. were taken at Laredo, Tex., on February 24, 1940, on orchid plants (*Cattleya*) in baggage from Mexico. A living larva of the East Indian bean pod borer (*Maruca testulalis* Geyer) was taken at New Orleans on December 16, 1939, in a string bean pod in ship's stores from Dominican Republic. Living specimens of the mealybug *Trionymus peregrinus* (Green) were taken at Washington, D. C., on November 8, 1939, on amaryllis bulbs in cargo from the Netherlands. A living specimen of the lygaeid *Sisannes contractus* Dist. was taken at Nogales, Ariz., on March 5, 1940, on tomato in cargo from Mexico. A living adult of the weevil *Anacentrinus blanditus* Csy. was taken at Brownsville, Tex., on January 15, 1940, on lettuce in baggage from Mexico. A living specimen of the lygaeid *Acroleucus vicinalis* Dist. was taken at Galveston, Tex., on September 27, 1939, with banana debris in cargo from Mexico. Living specimens of the scale insect *Phenacaspis fujicola* Kuw. were taken at Seattle, Wash., on December 22, 1939, on stems of *Wisteria* sp. in cargo from Japan. Eight living larvae of the East Indian bean pod borer (*Maruca testulalis*) were taken at Mobile, Ala., on March 2, 1940, in string beans in ship's stores from the American Virgin Islands. An adult of the cerambycid *Pogonocherus hispidulus* (Piller) was taken at San Francisc on March 7, 1940, in a cutting of *Ficus* sp. in cargo from Italy. A living specimen of the alticid *Diphaulaca* sp., near *aulica* (Oliv.) was found in the cabin of an airplane from Costa Rica at Brownsville, Tex., on May 23, 1940. H. S. Barber states that this species injures beans in Mexico and Central America. A very similar South American species, *D. aulica* (Oliv.), also attacks beans and its name has been much used in error for this species. A living adult of the mirid *Creontiades pallidus* (Ramb.) was intercepted at New York on January 13, 1940, on escarole in stores from Italy. It is reported as being injurious to cotton, lettuce, and other plants in Egypt. Living specimens of the aphid *Pineus borneri* Annand were intercepted at New York on June 27, 1939, on *Pinus koraiensis* in furnishings from Japan. This aphid is reported as an injurious insect in the Far East. Living specimens of the citrus blackfly *Aleurocanthus woglumi* Ashby were intercepted at Chicago on March 16, 1940, on lime leaves in mail from Jamaica. Living adults of *Cylas puncticollis* Boh. and living larvae and pupae identified as *Cylas* sp., probably *C. puncticollis*, were intercepted at Boston on May 17, 1940, in sweetpotato from Sierra Leone, Africa (see News Letter, v. VII, No. 6, p. 34).

Pathological interceptions of interest.--Interesting interceptions for which determinations were received during the month included *Acrospeira mirabilis* B. & Br. on chestnuts from Japan, on December 27, 1939, at Seattle; *Cercospora ipomoeae* Wint. on *Ipomoea pescaprae* from Mexico on December 26, 1939, at Brownsville; *Coryneum microstictum* B. & Br. on *Kerria japonica* from Japan on January 30 at Seattle; *Coryneum* sp., unlike the two species reported (*C. rhododendri* Schw. and *C. triseptatum* Peck.), on rhododendron from Canada on January 22 at Seattle; *Cryptospora* (*longispora* Servazzi?) on *Araucaria excelsa* seed from New Zealand on December 26, 1933, at Washington; *Eucephalobus* sp. (very close to *E. laevis* Thorne) on *Manihot esculenta* roots from Cuba on April 9 at New York; *Mycosphaerella* (*musae* (Speg.) Syd.)? on *Musa* sp. from Brazil on February 29 at Washington; *Phyllachora gratissima* Rehm. on avocado leaves from Mexico on April 26 at El Paso; *Puccinia magnusiana* Koern. on seeds and stems of *Phragmites communis* on April 23 at New York; *Sclerotium* sp. on *Nephrodium glabratum* from New Zealand on February 26 at San Francisco; *Septoria nodorum* Berk. on wheat-straw packing from England on May 23 at New York; *Septoria drummondi* E. & E. on *Phlox drummondi* cuttings from Bermuda by clipper on May 12 at New York; *Septoria taraxaci* Holl. on May 10 at New York on dandelion leaves in stores from Italy; *Uromyces dolicholi* Arth. on January 29, at New York on pigeonpea leaves in baggage from Cuba; and *Zygosporium oschioides* Mont. on palm ties on onions in cargo from Cuba on April 23 at New York.

DOMESTIC PLANT QUARANTINES

Chinch bug control begun.--From appropriations made for the control of emergency and incipient outbreaks of insect pests and plant diseases, limited funds have been made available for preliminary purchases of creosote for the control of chinch bugs in the infested States. A small field office force has been established in Chicago, Ill., with W. E. Dove temporarily in charge, located at 1208 New Post Office Building. From this office has been determined the availability of supplies of chinch bug materials, traffic routings, and tariffs to estimated destinations. This will also clear all information as to conditions of infestations and act as headquarters for procurement and delivery of creosote, of which 100 cars were being shipped by June 17. Early observations as to winter mortality of the bugs indicated a probable heavy outbreak unless subsequent weather conditions interfered. By mid-June indications pointed to serious subsequent damage to corn unless aggressive control operations were developed to protect this crop against migrations which were expected to occur in the immediate future. Infestations are indicated to be heaviest in Iowa, Kansas, Missouri, Nebraska, and Oklahoma.

Grasshopper development and control.--Grasshopper-control operations in the areas infested by the migratorial species were begun early in May in Texas, Oklahoma, and Colorado, and were increased rapidly toward the close of themonth as hatching progressed northward. Baiting was completed early in June in the area of the long-winged migratory species in New Mexico. By the latter part of May the hatch was general throughout many areas in the infested States, and control operations were carried on in some areas in all States except those of the northeastern part of the Great Plains, where the work was begun early in June. In that region low temperatures, rains, and wind in many areas retarded somewhat the hatch and development of the 'hoppers. The crops have developed rapidly, however, and it is believed that this situation, together with a slow sporadic hatch, may result in lessened damage. Much land formerly idle in the northern Great Plains is being cultivated this season, and the farm practices followed are better than heretofore from the standpoint of grasshopper control. In the crop 'hopper areas of the Middle West, the hatch was also retarded until the close of May, when it developed rapidly and farmers became very active in spreading bait. States and counties have participated in control activities. No extensive crop damage occurred in May.

Unusual baiting activities in two areas.--The most active grasshopper-control work early in June was in north-central Montana, where infestations of the lesser migratory 'hopper, principally in the first instar, appeared in greater populations than had been indicated by the fall survey. Farmers spread bait excitedly, and obtained excellent kills. Mixing stations have been operating 24 hours daily. Twenty carloads of bait material was mixed and distributed to farmers in a 6-day period. Bait materials far in excess of estimated needs have been furnished to Blaine, Choteau, Fergus, Hill, and Liberty Counties. Cooperation has been excellent and damage is not expected to exceed 10 percent, with a good chance for recovery of grain because of excellent moisture conditions. Nymphs are gradually spreading to pastures and ranges, next to the field margins and stubble. Heavy infestations of the same species are occurring in the Oklahoma and Texas Panhandles, in southeastern Colorado, and in two contiguous Kansas counties, where the 'hoppers are reported as concentrated on patches of Russian-thistle. The topography of this land, much of which is windblown sand, and the extent of the area make it impossible to use regular bait spreaders in most of the area. Baiting is being done by means of an autogiro and three planes.

Predators and dust in grasshopper areas.--Predators have been responsible in areas of several States for considerable reduction of grasshopper eggs and nymphs. Bee-fly and blister beetle larvae were recently reported as reducing grasshopper pods about 10 percent in four counties in southwestern North Dakota, and as much as 80 percent in two fields near Dickinson. Carabid beetles were reported numerous on egg beds of the long-winged migratory 'hopper, in the Panhandle counties of Texas. Birds, chiefly horned larks, in Las Animas County, Colo., were reported to have destroyed 50 percent of the 'hopper eggs in the more concentrated parts of the egg beds. Huge flocks of sea gulls were observed consuming large numbers of grasshopper nymphs in four Utah counties. In places in Wyoming wind-blown sand buried grasshopper field pods from 1 to 4 inches deep, and in Lincoln County, Colo., they were found under 2 inches of dust; however, a 75-percent hatch was expected in the latter area. Dehydration of egg pods in a few instances necessitated a marked reduction in ratings of the fall survey.

Mormon cricket development.--Mormon cricket hatching was completed at the lower elevations in most areas of the infested States the first week in May, whereas at the higher elevations some hatching was still taking place the latter part of the month. The first report of adult Mormon crickets was from Wasco County, Oreg., on May 1. Adult crickets also were reported in Washington the first week in May, in Nevada on May 13, in western Idaho on May 16, and in Utah, Montana, and Wyoming the week of May 19-25. May 13 is believed to be the earliest date recorded for adults in Nevada. Rapid migrations were occurring toward the close of the month and, although crop damage was held to a minimum during May, control crews in some areas were being hard pressed to divert crickets from crop lands, especially those immediately adjacent to heavily infested range areas. Mormon crickets in Wasco County were reported ovipositing in the week of May 19-25.

Mormon cricket control operations.--Control operations increased steadily during May, after a delay due to adverse weather conditions, and by the close of the month operations had reached the peak in a number of areas, while in others the thick cricket populations had been so reduced that control measures were no longer required. Power and hand-dusting, baiting, oil-on-water, and metal barrier, all have given excellent control and have been highly justifiable. States and counties have participated.

Various Federal agencies participate in the control of grasshoppers and crickets.--The substantial assistance given to the 1939 campaigns against the grasshoppers and Mormon crickets by various bureaus and divisions of the Departments of Agriculture and Interior, is again being made available for the present season. Arrangements have been completed with the Civilian Conservation Corps, the Indian Service, the Forest Service, National Park Service, Biological Survey, and the Division of Grazing of the Department of the Interior for assistance against these pests. Hand and power dusters, as well as trucks, are also being provided by some of these agencies. Last year's contributions by similar Federal agencies amounted to over $32,900 on the Mormon cricket work alone. The Federal Crop Insurance Corporation and Agricultural Adjustment Administration are encouraging farmers and counties to cooperate in control.

Peach-tree inspection.--The inspection of nursery and budwood properties and their 1-mile environs was completed in May in all States in which standard peach-mosaic quarantines are in operation, with the exception of Colorado. It was impossible to complete the nursery inspection in Mesa County, Colo.; however, most of the nurseries in that county are located in the heavily infected commercial area and grow stock for home use only. All nurseries in other States met the certification requirements of the standard quarantines. This is the first time in the history of the project that all nurseries in the regulated area in Texas have attained that standard. The disease was found within the environs of 13 such Texas nurseries in the current inspection, and all such diseased trees were removed prior to May 15, the time limit specified in the regulations. Reinspection will be made of all nursery stock in regulated areas next fall, prior to defoliation, as a further condition of certification. State and county participation in the phony peach or peach mosaic disease projects during May was represented by 48 field supervisory employees, and 1 office worker. These assistants were employed in Alabama, Arizona, California, Colorado, Missouri, Oklahoma, Tennessee, Texas, and Utah. Some 480 relief employees removed abandoned, escaped, and diseased peach trees during the month.

White-fringed beetle development.--Over a large part of the area infested with the white-fringed beetle the weather has been exceedingly dry, and this has resulted in most areas in retarding the development of the pests to the point where peak emergence of the adults is not expected prior to the last of June in the southernmost areas, and not earlier than the first of July in other areas. This is expected to result in an emergence period of not more than 2 weeks in practically all areas, a situation contrary to that of 1939 when, because of rainy weather, emergence extended over a period of 4 to 5 weeks. The situation has a decided bearing on control work and, unless there is a definite change in climatic conditions, the number of applications of insecticides needed to control the pests can be reduced.

White-fringed beetle inspection.--Intensive larval inspections carried on in May, throughout the infested areas resulted in locating a new infestation of the white-fringed beetle just outside the regulated area in Covington County, Ala. Intensive control operations and close inspection are being conducted on the infested property. Larvae were also found at points contiguous to formerly known infested area at Crestview, Fla., and on Blakely's Island in the Mobile, Ala., area, and dusting operations were promptly begun.

Spraying and dusting beginning in white-fringed beetle area.--Supplies of insecticides and ingredients used in the preparation of herbicide have been stored in each of the infested areas, ready for immediate use when the survey gave indications that the white-fringed beetles had reached the pupal stage and emergence might be expected. Direct control measures against the pests were begun in May in the various eradication areas. Host vegetation on waste and abandoned areas, on railroad yards, and in the vicinity of processing plants and other places from which there is danger of artificial spread, is being eliminated by the application of an oil-base, sodium-arsenite herbicide. Insecticides in the form of calcium arsenate or cryolite were applied during the month on infested localities of Alabama, Florida, Louisiana, and Mississippi. Repeated applications were made in many instances. Expressed in terms of one application, the area so dusted would total over 6,800 acres. At Bolton, Miss., power dusting was conducted over cottonfields. Discing has also gone forward in several areas, and the cleaning up of infested woodlands and other areas preparatory to dusting or spraying has been continued in Alabama, Mississippi, and Louisiana, with the assistance of W. P. A. labor.

Railway companies sign white-fringed beetle control agreements.--Agreements have been drawn up and signed by all 16 railway companies in the white-fringed beetle area, under which such companies have agreed to spray their tracks and premises in the infested areas, applying herbicide 1 to 5 times at the discretion of the Bureau, furnishing also engines and tank cars of specified capacity and the labor for their operation. The Bureau furnishes the spray ingredients and certain parts of the spray apparatus, and supervises the operations. Dealer-carrier permits have accordingly been issued to the above companies by the Bureau and the State concerned. Such dusting operations were in full progress during May.

Sweetpotato weevil control activities.--Within the eradication areas of the 4 States in which cooperative projects are conducted, but 4 sweetpotato weevil infestations were found in the trapping and inspection activities in May. Over 2,400 traps operated in Baldwin County, Ga., caught 5 adult weevils. Traps were placed in centers of infestations in Thomas County, Ga., without capturing any weevils. With nearly 300 traps in a Mississippi area, but 2 weevils were caught, and trapping on 30 farms in Nacogdoches and Cherokee Counties, Tex., gave negative results. Infested sweetpotatoes moving into Mississippi were intercepted by State inspectors. Pest-control officials of other States suppressed the movement of restricted materials coming into the control areas. State-sponsored W. P. A. laborers cleaned and destroyed host material on infested properties in Alabama and Mississippi. In Thomas County, Ga., wild host plants near formerly infested properties where normal sweetpotato plantings have not been resumed, were inspected, with negative results. Over 4,600 such plants of the Ipomoea genus, most of which were the huge-rooted I. pandurata, or "Indian potato," were dug by W. P. A. laborers, and inspected by the regular force.

Citrus canker found in Louisiana.--State inspectors found citrus canker on April 9 in Jefferson Parish, La., between New Orleans and the Gulf coast. Over 800 Citrus trifoliata from 3 to 5 years old were found so infected. Canker had been located some 10 years ago at a point 0.3 mile away, at which time all citrus trees on the property then infected were destroyed. The cankerous trees on the property recently found infected have been destroyed.

Uncertified plant shipments reported to States.--During inspection tours at Saint Paul in May, 100 plant shipments which were not certified in compliance with the Minnesota pest-control regulations were observed by the transit inspectors. Many of these shipments were important in that they were capable of carrying pests, such as the raspberry mosaic, the control of which has cost the State of Minnesota large sums of money.

Eighty of these State violations were found in the mails, 20 in express. The reporting to the States concerned, of uninspected plant shipments observed in the course of regular transit inspection is an established practice of transit inspectors. Such shipments of woody plants consigned by parcel post are also reported to the Post Office Department as infringements of the postal regulation which requires that such packages be accompanied by a State nursery-inspection certificate. Nearly 400 such shipments, observed at the various transit-inspection points, have been reported to that Department in the last 3 months.

Violations of Federal quarantines intercepted.--Over 500 apparent violations of Federal domestic plant quarantines were intercepted at transit-inspection points in May. Of these shipments, 4 were consignments of elms from the area under regulation because of the Dutch elm disease, addressed to points in Florida, Pennsylvania, South Carolina, and Virginia.

Wide shipping of plant material noted.--"The movement of nursery stock and plants has been broader this season than at any time in our memory," writes a seasoned inspector. "We cannot recall a year that saw such a wide distribution. Plants have been observed and inspected from every State in the Union and the Territory of Hawaii, as well as an air-express shipment of cut orchids from one foreign country."

CONTROL INVESTIGATIONS

Penetration of methyl bromide gas into soil.--H. H. Richardson and A. H. Casanges have found by insecticidal tests that methyl bromide gas penetrates well into either dry or damp greenhouse soil, but that very little penetration takes place into very wet soil. The results of one series are as follows:

Penetration of CH_3Br into dry, damp, and very wet soil in greenhouse, as indicated by insect mortality (insects buried in 9-inch pots of soil)

Insect	Mortality in soil		
	Dry	Damp	Very wet
	Percent	Percent	Percent
Flour beetle------------	100	100	3.9
Mexican mealybug--------	100	100	0
Chrysanthemum aphid-----	100	100	0

Other tests have given similar results. These results are also corroborated by chemical tests made in November 1939 on the methyl bromide concentrations found in experiments in a metal-lined fumigation chamber , analyses having been made by J. H. Dudley, of the National Institute of Health.

Dispersion of pyrethrum and rotenone.--The June issue of Soap contains an article on a new method of dispersing pyrethrum and rotenone in air. The authors of this paper are W. N. Sullivan, L. D. Goodhue, and J. H. Fales, of the Bureau of Entomology and Plant Quarantine. In summary, this publication states that an aerosol produced by spraying safrole solutions of rotenone and pyrethrum oleoresin alone and in combination, on a hotplate at 375° C., was tested against the housefly. The test flies were liberated in a 1,150-cubic foot room and subjected to exposure for 1 hour. In no test was a mortality of less than 74 percent obtained after 72 hours, and with a rotenone-pyrethrum mixture a kill of 95 percent was obtained. A mortality of 99 percent was obtained when adult Culex mosquitoes were exposed for 10 minutes to the aerosol produced in a similar way from an ethyl alcohol solution of pyrethrum. The possibility of use of this method for the control of tropical mosquitoes within airplanes is suggested.

INSECTICIDE INVESTIGATIONS

More new insecticides patented.--On May 14, 1940, there was issued to M. S. Schechter and H. L. Haller a patent (U. S. No. 2,200,564) covering the compound phthalonitrile as an insecticide. This substance is a colorless crystalline solid which melts at 141° C. It has the formula $C_6H_4(CN)_2$, is insoluble in water, and soluble in organic solvents. Experiments have shown it to be very toxic to the melon worm, the southern beet webworm, the Hawaiian beet webworm, the diamond-back cabbage worm, the southern armyworm, the Colorado potato beetle, the yellow bear, the celery leaf tier, the codling moth larva, and the screwworm. Preliminary tests indicate it is not injurious to foliage. Since phthalonitrile is the starting material for the preparation of a new line of stable blue pigments, it soon should be available in commercial quantities. On the same date, F. E. Dearborn was granted U. S. Patent No. 2,201,103, covering the use as both insecticide and fungicide of a homolog of paris green made from sulfurized fatty acids, rather than acetic acid.

Obaculactone identical with limonium.--In the work of the Division with the Amur cork tree, Messrs. Haller and Schechter encountered a material previously described by other workers and known as obaculactone. This substance, later identified by other workers as identical with evodin and dictamnolactone, as obtained from other plants, has now been identified in the Division of Insecticide Investigations as identical with the compound limonin as obtained from the pulp and seeds of the Valencia orange. It is suggested that the other names for this substance be dropped in favor of limonin, because it was the first one used. The Amur cork tree and the orange tree belong to the same family, namely, Rutaceae.

Fumigation with smoke from derris and pyrethrum.--In the October 1, 1939, issue of the News Letter (v. VI, No. 10, pp. 28-29) some preliminary results obtained by L. D. Goodhue and W. N. Sullivan against the housefly with the smoke from burning derris were reported. These authors have now published their findings in the April 1940 issue of the Journal of Economic Entomology (33(2):329), including the results of similar tests with pyrethrum. There is apparently little value in such a use of pyrethrum, but the results with derris were encouraging.

BEE CULTURE

Bacillus larvae spores not removed from sirup by bee's honey stomach.--A. W. Woodrow and E. C. Holst, Laramie, Wyo., report that sirup containing spores of Bacillus larvae White, recovered from the honey stomach of worker bees fed this material, was not found to be materially changed in spore content, as is the case of pollen content of ingested sirup or honey.

Causes of empty brood-nest cells.--Regarding his study on the causes of empty cells within the brood-nest, J. D. Hitchcock states: "The work of the summer of 1939 has indicated that the spotted character of brood in certain healthy colonies is apparently due both to irregular laying, which seems to be characteristic of certain queens, and to a heavy brood mortality, occurring in all stages of development but principally before the fifth day from the time of egg laying. Brood mortality is influenced by many factors, including colony population, availability of nurse bees, total amount of brood in the colony, pollen reserves, and many uncontrollable factors, such as seasonal changes. Exposure of the brood during counting and photographing operations was apparently not responsible for serious mortality in these tests. Great variations in brood mortality occurred in colonies headed by queens of the same strain and even in individual colonies, so that it is impossible from the results of these tests to state that a high or a low mortality is characteristic of a given strain."

Multiple matings improve egg-laying performance of queen.--W. C. Roberts, Baton Rouge, La., gives the following data obtained from a study on the natural matings of queen bees: "Of 25 naturally mated queens (16 double-mated and 9 single-mated) introduced into normal colonies in August 1939, 8 queens were being or had been superseded in March 1940. Of the 16 double-mated queens, 2 had been superseded and 1 was superseding, and of the 9 single-mated queens, 4 had been superseded and 1 was superseding. The colonies headed by supersedure queens were outstanding in quantity of brood and bees, and colonies headed by double-mated queens were better than those having single-mated queens."

Factors governing queen rearing in swarm box.--E. Oertel, Baton Rouge, draws the following conclusions based on results obtained in 1939 relative to queen-cell and royal-jelly production: "It appears there is no relationship between total weight of larvae and total weight of royal jelly per swarm box, or between weight of larvae and pounds of bees per box. There is a slight positive relationship between percentage of cell acceptance and pounds of bees per box, between weight of royal jelly and pounds of bees, between total weight of larvae and percentage of cells accepted, and between total weight of royal jelly and percentage of cells accepted."

Tribute to C. S. Bisson.--Frank E. Todd, Davis, Calif., pays the following tribute to the late Dr. Charles S. Bisson, of the College of Agriculture, University of California, Davis, Calif., who rendered such valuable cooperative assistance to the Division in studies of wax: "The loss of Dr. Bisson is a serious blow to the chemical work planned for this laboratory. The enlightenment resulting from his work on beeswax and pollen indicates a crying need for chemical work in the bee field. The final report of Dr. Bisson's work on fractioning of beeswax by use of temperatures and solvents indicates the widely different physical and chemical character of the various fractions. Although far from complete, this work suggests that beeswax properties may be altered by removing various fractions, which would widen its possible commercial uses and markets. The studies of pollen pigments, started by Dr. Bisson, showed them to be of both water- and fat-soluble types. It has already been shown that the fat-soluble pigments give the yellow colors to beeswax, but this quarter's work indicates that honey colors may be produced by the water-soluble pigments. Fresh nectars are invariably white, but honeys range in color from water-white to amber, even though from the same plant species, when produced in different localities. By contact with certain pollens, sirups have taken on characteristic honey colors. Honey color is a vital economic factor, as prices are based largely on color grades."

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Another mosquito new to United States.--In The News Letter dated April 1, 1940 (v. VII, No. 4, p. 28) was reported the collection and rearing of Deinocerites spanius Dyar and Knab at Brownsville, Tex., by Frank W. Fisk, Jr., of the Aedes aegypti Control Unit, of the Public Health Service. The same collector has recently submitted a single male of Culex chidesteri Dyar, trapped at Brownsville on December 4, 1939. This species was described from Colon, Panama, and has also been taken in Venezuela and Brazil. The species breeds in ground pools. As it has not been found between Panama and Brownsville, it is possible that it has been introduced by airplane.

Receipt of rare ant.--About a dozen specimens of Cerapachys augustae Whlr. were received for determination from the Wild Life and Fish Service. These specimens were taken from the stomach of an armadillo at Huntsville, Tex. M. R. Smith states that, except for the types of this very rare and primitive ant, this is the second lot of specimens ever to have been taken.

Singing Orthoptera treated as pets.--On May 15, 1940, A. B. Gurney received for identification a male of the cricket Gryllus campestris L., in a small cage of wood and wire taken from personal baggage aboard the American Clipper plane at New York. The cricket had originated in Portugal, but had been obtained by the passenger at a party in London. Many of these crickets were said to be for sale in Lisbon. This species is one of those about which Fabre wrote. There have also been received for identification two male specimens of the katydid Mecapoda elongata (L.) in a small wooden cage, intercepted at Honolulu from Japan on September 22, 1938. This is a common species in the Orient. At San Francisco and other ports on the Pacific coast, crickets of various species are often found as pets in the crews' quarters of ships from the Orient. The keeping of crickets for fighting and singing has been especially well developed in China. In 1927 Berthold Laufer, curator of anthropology at the Field Museum of Natural History, Chicago, prepared a detailed and well-illustrated booklet on "Insect-musicians and cricket champions of China." The Japanese keep crickets for singing, but not for fighting.

A new food plant for the chinch bug.--H. S. McConnell, of the University of Maryland, has recently submitted for identification some chinch bugs determined by H. G. Barber as Blissus leucopterus (Say), collected on the common southern cane (Arundinaria sp., probably tecta) at Anderson, S. C., on March 1, 1940. These were found in considerable number under the basal sheaths of the leaves and presumably were feeding there.

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An apparently new rice pest in Colombia.--The Secretary of Agriculture, Ibague, Colombia, has transmitted for identification through J. L. Colom, chief of the Division of Agricultural Cooperation, Pan American Union, a number of specimens of a cydnid (one of the negro bugs) reported as causing damage to ricefields in the Department of Tolima, Colombia. It was stated that these also fed on two weeds, Triumfetta sp. and Cassia occidentalis. These specimens were determined by H. G. Barber as Alkindus atratus Distant, a widely distributed species recorded from Mexico, Central America, Colombia, Venezuela, and the Republic of Santo Domingo. C. H. Ballou has collected it on Cenchrus viridis in Costa Rica.

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